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THE NEW ENGLAND BOTANICAL CLUB

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PINGUICULA (LENTIBULARIACEAE) IN THE SOUTHEASTERN UNITED STATES

C. E. Wood, Jr. and R. K. Godfrey[1]

Four distinctive species of the insectivorous genus *Pinguicula* L. have long been recorded from the southeastern United States. All are members of subgenus Isoloba (Raf.) Barnhart, a group represented outside of this area by *P. lusitanica* L., of Atlantic Europe and northwestern Morocco, and about six species of South America. Three of the species of the Southeast, *P. caerulea* Walt., *P. lutea* Walt., and *P. pumila* Michx. are of fairly widespread occurrence on the outer portions of the Coastal Plain. *Pinguicula pumila*, with the widest range of all, occurs from southeastern North Carolina to southernmost Florida and the Bahamas and westward to central Louisiana and eastern Texas. The fourth species, *P. planifolia* Chapman, a much less well known plant, centers primarily around the Apalachicola River, in western Florida, but also has been collected westward to Mississippi near the coast.

In the course of extensive field work in western Florida, a conspicuous fifth species, which proves to be undescribed, has been collected in a number of localities by Godfrey. It has subsequently been found to occupy a range from southwestern Georgia and western Florida to southern Mississippi

[1] One of a series of miscellaneous notes and papers arising from researches on the flora of the southeastern United States made possible by a grant from the National Science Foundation and by the interest and support of George R. Cooley in this area. A part of the work of the junior author which contributed to this paper was made possible by National Science Foundation Grant G2010 and a grant-in-aid from the Research Council of Florida State University. Earlier papers in this informal series were R. B. Channell, Reappraisal of two plumose Rhynchosporas of the southeastern United States, Rhodora 58: 335–343. 1956; C. W. James, Notes on the cleistogamous species of *Polygala* in southeastern United States. Rhodora 59: 51–56. 1957, and A new variety of *Stipulicida setacea*. Rhodora 59: 98. 1957.

and to have been confused variously in this area with *P. caerulea*, *P. planifolia* and *P. pumila*. Field and herbarium studies of this and the other species of the Southeast show, however, that the undescribed plant is quite distinct from those previously described both in its morphology and ecology.

In the field, the new species immediately attracts attention not only by its characteristic and showy corolla but by its oc-

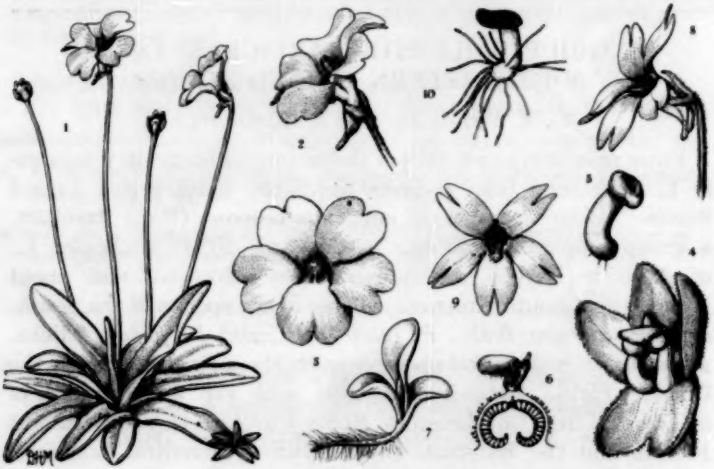

Fig. 1–7. Pinguicula primuliflora, Escambia Co., Fla. (see *Godfrey 54599*). 1. Habit, × ½. 2, 3. Lateral and face-views of corolla, × 1. 4. Calyx, stamens and pistil, × 4. 5. Stamen, × 6.6. Pistil, the ovary sectioned to show free-central placentation (semi-diagrammatic); note two-lobed stigma with pollen-holding hairs on underside of larger lobe, × 6. 7. Seedling, with primary root, hypocotyl, single cotyledon and two leaves, × 5. Fig. 8–9. P. planifolia, Gulf Co., Fla. Corolla, two views, × 1. Fig. 10. P. lutea, Fla., young seedling, with seed-coat, anchoring ring of "root-hairs" at base of hypocotyl, the primary root as yet undeveloped, × 10. Drawings by Dorothy H. Marsh.

currence in habitats unusual for *Pinguicula* in the Southeastern States. In western Florida it occurs mostly in the shade of evergreen shrubs or trees in areas with *Sphagnum* or *Pallavicinia*, along spring runs or in springy places, almost always where there is flowing water. In southern Mississippi it seems likewise to be associated, for the most part, with moving water. Dr. R. B. Channell, now of Vanderbilt University, has observed and collected the plant in George and Stone counties, where he found it occurring in grassy tussocks, on the bases of *Nyssa*

saplings, and on mill-timbers, in association with *Orontium* or *Nymphoides* growing in clear, flowing water. Some specimens were collected in moist, sandy soils in pinelands but it may be remarked that these plants are less well developed than those from wetter localities. Dr. James D. Ray kindly visited some of Dr. Channell's localities and others and sent living plants, along with further ecological notes, in the spring of 1957 and has also sent specimens of this species from the herbarium of Mississippi State College. In Stone County, Dr. Ray found the plant associated with *Eriocaulon*, *Lachnocaulon*, *Drosera*, *Helenium brevifolium*, *Selaginella*, and *Mayaca* in the wet, grassy margin of a roadside ditch along the margin of a pine-mixed hardwood thicket (*Ray 8020*). In Harrison County he reports the plant as local, forming tussocks with *Sphagnum* and *Mayaca* around the bases of *Nyssa biflora* in a shallow pool with an overstory of *Magnolia*, *Ilex*, *Kalmia*, *Viburnum* and *Rhus Vernix* in a second-growth pine wood (*Ray 8031*).

In contrast to this general ecological picture, *Pinguicula caerulea*, *P. lutea*, and *P. pumila* favor moist to wet, sandy localities, primarily in pine-barrens and savannas. *Pinguicula planifolia* grows in the shallow water of pond-margins or ditches, *Sarracenia* bogs and "flatwoods" depressions, usually with the rosettes submerged (an interesting ecological divergence for a member of this insectivorous genus). In each of these instances, the plants generally grow fully exposed to sun in areas where any surface-water is standing water. In spite of its general association with moving water, the new species, described below, flourishes in *Sphagnum*-filled pots standing in water, a rewarding feature which has made possible the examination of the plant at leisure and in some detail.

Pinguicula primuliflora Wood and Godfrey, sp. nov.

Pinguicula rosulata crenicola saepe sphagnicola subgeneris Isolobae (Raf.) Barnhart. Folia viridia oblonga, basi spathulata, apice rotundata, (2.5–)6–9 cm. longa, (1–)2–2.5 cm. lata. Scapi 8–15 cm. longi. Sepala 5, 2 infima semicoalita, 2 lateralia oblonga vel ovata, 4–5 mm. longa, 2–3 mm. lata. Corolla (in sicco) (15–)20–26 mm. longa; lobi corollae violaceo-caerulei basi albi, obovati vel suborbiculares aequi, (8–)10–13 mm. longi, 2–3 mm. lati, apice emarginati crenis (1.5–)2–3 mm. profundis; tubus flavus venis brunneis, 4–5 mm. longus, palato conspicuo conico-aciculari, 4–6 mm. longo ex tubo (3–)4–5 mm. exserto. Calcar subcylindricum

flavum, (3–)4–5 mm. longum. Stigma album bilobatum, lobus inferior major. Capsula depresso-globosa, 5 mm. diametro, bivalvata. Semina numerosa subcylindrica, truncata, brunnea, 0.5–0.7 mm. longa.

A *Pinguicula* of subgenus Isoloba (Raf.) Barnhart. Flowering rosettes 4–16 cm. wide, the leaves oblong, spatulate at the base, rounded at the tip, (2.5–)6–9 cm. long, (1–)2–2.5 cm. wide. Scapes 1-flowered, ebracteate, 8–15 cm. long at flowering. Flowers (pressed) ca. (15–)20–26 mm. long, including the spur. Sepals 5, the 3 upper free to the base, the lower united about ½ their length, the lateral sepals oblong to ovate, 4–5 mm. long 2–3 mm. wide. Corolla with nearly equal broadly obovate (or obovate) to suborbicular lobes (8–)10–13 mm. long, 10–14 mm. wide, shallowly notched (1.5–)2–3 mm., widespreading in sunlight, often overlapping, the limb then 15–30 mm. wide. Tube subcylindric, compressed somewhat dorso-ventrally 4–5 mm. long (along the lower side), (3–)4–5.5 mm. wide in pressed specimens, with a conspicuous conic-acicular palate ca. 4–6 mm. long at the base of the lowermost corolla lobe and exserted (3–)4–5 mm. from the mouth of the tube. Corolla tube abruptly contracted into the cylindric spur (3–)4–5 mm. long, forming an angle of 45–60 degrees with the tube. Outer ¾ of corolla lobes wisteria-violet (Ridgway) to almost white, white at the base, the tube lemon-yellow veined with Brussels brown, especially on the upper side, the spur yellow or with brown veins. Palate densely bearded with slender lemon-chrome clavate-tipped multicellular hairs; throat of tube behind palate with yellow to red smooth, short-stalked, flattened, pyriform or mitten-shaped multicellular hairs. Stamens 2, the anthers pale, the filaments white, the pollen nearly white. Ovary subglobose, glandular, the stigma white, unequally 2-lobed, the lower, larger lobe curving over the anthers. Capsule depressed-globose, ca. 5 mm. in diameter, 2-valved; seeds numerous, minute, 0.5–0.7 mm. long, subcylindric-truncate, brown, the testa of smooth, thick-walled nearly isodiametric cells. (Fig. 1–7, 11–14, 30.)

Specimens examined: **Georgia.** Early Co.: acid bog, 2 mi. s. of Hilton, *Thorne 2919 & Muenscher*, 10 Apr. 1947 (GH). **Florida.** Escambia Co.: on banks of stream, at very edge of water, and amongst *Sphagnum* in shrub bog, Bayou Marcus Creek, west of Pensacola, *Godfrey 54599*, 26 Mar. 1956 (FSU, GH). Franklin Co.: common, open moist sands of shrub-bog–savanna, 15 mi. n. e. of Eastpoint, *R. Kral 4037a*, 9 Feb. 1956 (FSU). Liberty Co.: several plants on wet sands along margin of railroad ditch, shrub–slash-pine bog, 6 mi. n. of Vilas, *Kral & Godfrey 1960*, 26 Feb. 1956 (FSU). Okaloosa Co.: many plants in shallow water of and on the banks of spring-run, in dense bay-swamp, 1 mi. e. of Crestview, *Godfrey 54553*, 25 Mar. 1956 (FSU, GH). Santa Rosa Co.: in sphagnous evergreen shrub bog, 3 mi. e. of Jay, *Godfrey 54540*, 25 Mar. 1956 (FSU, GH). Walton Co.: in shallow running water, intermixed with *Sphagnum*, in branch-bay woodland, ca. 12 mi. s. of De Funiak Springs, *Godfrey 54408*, 5 Mar. 1956 (FSU, GH); very abundant in shallow running water all over a springy, swampy woodland, intermixed with *Sphagnum*, at Cluster Springs, *Godfrey 54416*, 4 Mar. 1956 (GH-Type; FSU), *Godfrey & Harrison 55396*, 7 Mar. 1957 (FSU, GH); common in sun, fluvial swamp,

6 mi. n. of Portland, *Tyson 694*, 4 Mar. 1952 (GH). **Mississippi.** George Co.: growing on clumps of grass in the edge of Cedar Creek at Miss. Route 63, *Channell*, 2 Aug. 1953 (sterile plants) (GH); mud flats of Cedar Creek, Agricola, *Demaree 34674*, 21 Feb. 1954 (GH); Cedar Creek, not far from Agricola, *Cooley 3399, Pease & Demaree*, 3 Apr. 1955 (MISSA). Harrison Co.: Lyman Bog, *Cooley & Ray 3225*, 19 March 1955 (GH, MISSA); local, around base of *Nyssa biflora* in shallow pool, in secondary pine wood, 1 mi. n. of Airey, 3 mi. e. of Saucier, *Ray 8031*, 20 Apr. 1957 (GH, MISSA). Jackson Co.: swampy grass field, ½ mi. n. of Harleston, *Diener 838* (MISSA). Stone Co.: occurring with Goldenclub [*Orontium*], on little knolls in stream and along its edge, among clumps of grass, cool, fresh mill-stream, between Hattiesburg and Wiggins, Highway 45, *Channell*, 9 Apr. 1951 (MISSA); fast moving streams, Wiggins, *Brown*, 1 Apr. 1950 (MISSA); low, moist pinelands in sandy soil, 15 mi. e. of Perkinston, *Channell*, 27 Mar. 1951; floor of pine forest, sandy soil, University Forest Lands, near Perkinston, *Channell*, 4 Apr. 1951 (MISSA); margin of roadside ditch along margin of pine–mixed hardwood thicket, near McHenry, south of Perkinston, *Ray 8020*, 20 Apr. 1957 (fl. and mature fruit) (GH, MISSA). All collections flowering, unless otherwise noted. (Abbreviations for herbaria are those of Lanjouw and Stafleu, Index Herbariorum, Part I, ed. 3, 1956.)

Pinguicula primuliflora is readily distinguished by the habitat, the oblong leaves, the blue-white-yellow pattern of the corolla, the well-exserted conic-acicular palate, the characteristic form of the fleshy hairs in the throat of the corolla, the widespreading, shallowly notched corolla-lobes, the relatively narrow and short tube, and the spur 4–5 mm. long. Undersized specimens which bear small flowers may be confused with *P. pumila* but the exserted palate and the very different hairs on the palate, at its base, and on the walls of the corolla-tube will immediately distinguish such specimens. The short spur apparently has resulted in confusion with *P. planifolia* but in that species the spur is only 2–3 mm. long, almost sac-like, the corolla is violet to almost magenta with a darker tube, the corolla-lobes are deeply cleft into two acutish segments, and the hairs in the throat of the corolla are quite different.

In the course of working out the characteristics of *Pinguicula primuliflora* a number of observations have accumulated which suggest additional bases for future investigations in the genus. Unfortunately, with much of the *Pinguicula* material (including types) accumulated by the larger herbaria having been destroyed in Berlin during World War II, work on the genus as a whole will be difficult. Enough material is available to us, however,

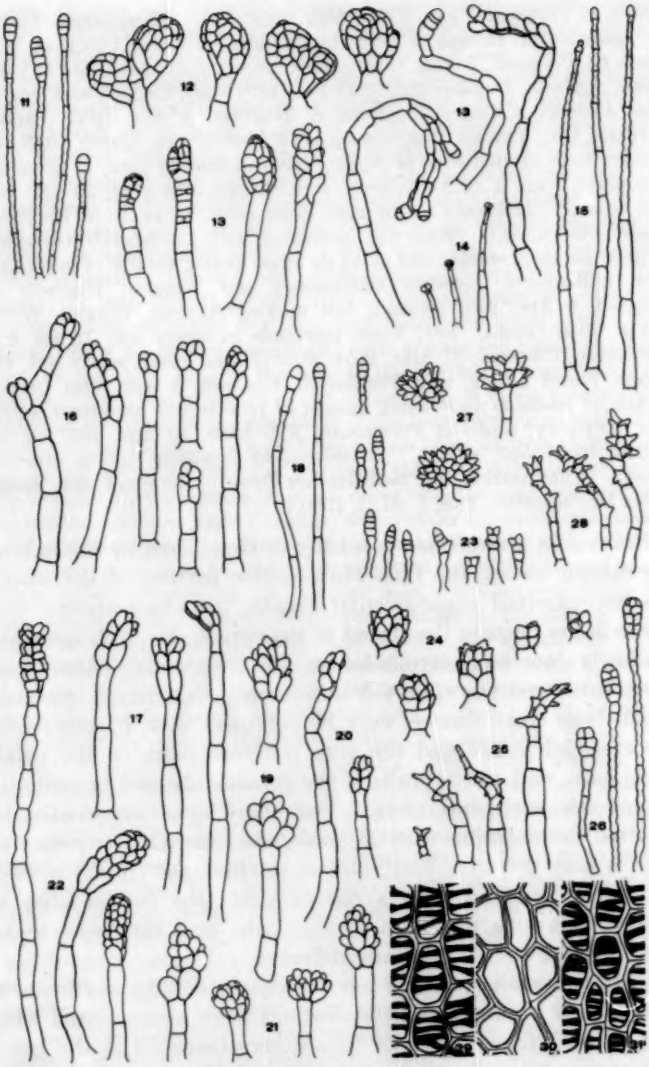

Fig. 11–31. Corolla-hairs and seed-coats of Pinguicula. Fig. 11–14. P. primuliflora, *Godfrey 54599*, Escambia Co., Fla. 11. Four hairs from palate. 12. Four hairs from base of palate on floor of corolla-tube. 13. Seven hairs from lateral walls of corolla-tube. 14. Three glandular hairs from floor of corolla-tube near base

to show a number of interesting features in those species which occur in the southeastern United States.

Most of the taxonomic characteristics reside within the elaborate corollas which appear to be adapted to pollination by bees or flies. The varying flower-colors, the size of the corolla-lobes, the diameter and length of the tube, the length of the spur, are all features, useful in taxonomy, which must play important roles in the floral biology of each species. Even more interesting is the palate (a conspicuous structure in this subgenus) of varying size and clothed with hairs of varying length, structure, and color, which apparently serve as footholds for the insect visitor. Directly behind the palate on the floor of the corolla-tube is a series of yellow to red shortened, enlarged multicellular hairs. The function of these hairs is not known: although succulent in the living flower, they do not appear to be secretory. Though lacking in *P. caerulea*, they are of distinctive form in each of the four species in which they occur, thereby providing excellent taxonomic characters. Along the lateral walls of the tube are still other multicellular hairs, varying in shape and structure, and also of unknown significance in the functioning of the corolla. (See fig. 11–28.) The characteristic shapes of the hairs are frequently distinguishable even in carefully opened dried corollas and all may be readily observed in corollas which have been re-expanded by soaking or boiling.

The pollination of *Pinguicula alpina* L. and *P. vulgaris* L. (both of subgenus PIONOPHYLLUM A. DC.) has been described by Müller (1881; see also Knuth, 1906, p. 133 and 1909, p. 235), who noted the functioning of hairs within the corolla in connection with the pollination of *P. alpina* by flies and that of

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of spur. Fig. 15–17. *P. caerulea*, *Wood*, 1956, Carteret Co., N. C. 15. Three hairs from palate. 16. Six hairs from walls of tube. 17. Three hairs from base of palate. Fig. 18–20. P. LUTEA, *Godfrey 52981 & Almodover*, Franklin Co., Fla. 18. Two hairs from palate. 19. Two hairs from base of palate. 20. Two hairs from walls of tube. Fig. 21–22. P. LUTEA, *Channell 2808*, Columbus Co., N. C. 21. Four hairs from base of palate. 22. Three hairs from walls of corolla-tube. Fig. 23–25. P. PUMILA, *Godfrey 54483 & Kurz*, Franklin Co., Fla. 23. Eight hairs from palate. 24. Five hairs from base of palate. 25. Four hairs from walls of tube. 26–29. P. PLANIFOLIA, living plants, *Godfrey*, Gulf Co., Fla. 26. Three hairs from palate. 27. Three hairs from base of palate. 28. Three hairs from walls of tube. 29. Cells of seed coat. 30. P. PRIMULIFLORA, cells of seed coat. 31. P. CAERULEA, cells of seed coat.

P. vulgaris by bees. The flower of the former species is of the pinch-trap type with a zone of inwardly directed bristles behind two conspicuous yellow sacs which ornament the entrance to the corolla-tube. The hairs hinder the easy exit of flies visiting the flowers and bring about the contact of the back of the fly with the anthers. The stiff hairs which grasp the body of the fly occasionally imprison the insect within the tube. Although floral biology of the Southeastern species has not been studied, it appears that insects may become trapped occasionally, for on one herbarium specimen of *Pinguicula lutea* a well-pressed one-centimeter-long bee is inclosed within the corolla! The pollination and floral biology of these species should be a fascinating field for further investigation.

In this genus, the precise use of floral characteristics for taxonomic purposes will call for more attention on the part of collectors. The one-flowered scapes of *Pinguicula* mitigate against the dissection of herbarium materials except in cases in which extra corollas have been provided specifically for that purpose. Most pressed flowers are distorted or pressed helter-skelter, while little or no information is given on the original color pattern of the corolla. Although the latter may be obvious in recently collected specimens, the colors inevitably fade with time. It is highly desirable to have additional well-pressed corollas, some spread open to show the palate and the interior of the tube, as well as the lobing of the corolla. Plants of *Pinguicula* are indeed somewhat discouraging subjects for the preparation of herbarium specimens, having as they do slimy, fleshy, brittle leaves which tend to recurve when the tightly packed rosette is dug from the ground. Although the fresh plant is bulky, the leaves dry to fragile tissue-thinness. The use in pressing of wax-paper with the leaves and of cleansing or facial tissue with the flowers will produce excellent results, however.

Although size-measurements are useful in distinguishing between the various species, Pinguiculas have the distressing feature of flowering either as small or large plants with the corollas varying accordingly in size. In *P. primuliflora* the limb may vary from 15 to 35 mm. across, the smaller flowered specimens overlapping with *P. pumila* in flower-size. In general,

the length of the spur and that of the palate are less variable (even in small flowers), but even here occasional measurements may overlap in several species.

With most of the taxonomic characters based upon the conspicuous corolla, the less striking and not certainly identifiable fruiting specimens are seldom collected. The seeds, more or less similar in appearance, are all brown, minute (mostly about 0.5 mm. long), and with a seed coat of large, thick-walled cells which produce a reticulate surface. In *Pinguicula caerulea*, *P. lutea*, *P. pumila*, and *P. planifolia* the inner and lateral walls of the cells are thickened only in bands reminiscent of secondary thickenings of xylary elements. The absence of such thickenings in *P. primuliflora* provides another means of distinguishing this species. (See fig. 29–31.)

In connection with the biosystematics of the species occurring in the Southeast, it may be noted that, although two or three species may grow in the same vicinity, there is no evidence of hybridization. All of our species are normally cross-pollinated, abundant seed being set in the wild, but are self-fertile when artificially pollinated. Although *P. primuliflora* readily matures seeds in cultivation, artificial pollination of this species with *P. planifolia*, *P. lutea* and *P. pumila* has resulted in each instance in seeds which either abort before maturity or fail to germinate. Artificial hybrids between members of subgenus Orcheosanthus A. DC., of Mexico, have been reported however, and two naturally occurring hybrids between species of subgenus Pionophyllum A. DC., have been described from Europe. The sterile *P.* × *Scullyi* Druce occurs rarely where the closely related *P. grandiflora* Lam. ($2n = 64$) and *P. vulgaris* L. ($2n = 64$) come together. *Pinguicula* × *hybrida* Wettst. is morphologically intermediate between *P. alpina* L. ($2n = 32$) and *P. vulgaris* L., and is also sterile, as would be expected.

The only other chromosome-number reported from the genus is that of *P. villosa* L. ($2n = 16$) (Knaben, 1950)[2], a diminutive arctic species, also of subgenus Pionophyllum. The polyploid

[2] Áskel Löve has obligingly called our attention to this count and to that for *P. bicolor* Woloszczak, $2n = 64$ (Zurzycki, J. Studies in Pinguicula-species occurring in Poland. Frag. Flor. & Geobot. [Krakow] 1: 16–31. 1953), which was inadvertently omitted. To the numbers included here should also be added that reported by Heitz (Zeitschr. f. Bot. 18: 652. 1925) for "*P. caudata*," $2n = 44$, a member of subgenus Orcheosanthus.

series of 16, 32, 64 now known from this subgenus (Löve, & Löve, 1944; Doulat, 1947; Knaben, 1950) indicates that counts of other species should be of considerable interest.

The species of the southeastern United States may be distinguished by the following key:

a. Scapes villous below with long, non-glandular hairs; palate broad, densely clothed with pale hairs; corolla-tube without short, enlarged fleshy hairs at the base of the palate within; corolla-limb violet-blue, the tube greenish, conspicuously ventricose, (6–)7–11 mm. wide (pressed), veined with deep violet, the spur greenish, 5–8 mm. long. . . . . 1. *P. caerulea.*

a. Scapes not villous below, lacking long, non-glandular hairs; palate with bright yellow hairs; corolla-tube with enlarged, fleshy hairs at base of palate within.

b. Palate hardly or not at all exserted from the mouth of the corolla-tube, conical (obtuse in pressed specimens), ascending, about 2 mm. long, clothed with short hairs with obtuse to conical terminal cells; corolla, including spur, 15–20 mm. long, the tube 2–4 mm. wide (pressed), the lateral corolla-lobes (3–)5–7 mm. long, suborbicular, notched about 1 mm. or less, the spur 3–5 mm. long; corolla-limb lavender to white, pink or yellow, the tube violet or yellow. . . . . 3. *P. pumila.*

b. Palate conspicuously exserted (usually 3–6 mm.) from corolla-tube, conic to conic-acicular, densely clothed with slender hairs with more or less clavate tips, the terminal cells rounded; corolla usually more than 20 mm. long.

c. Spur 2–3 mm. long, sac-like, greenish; corolla-lobes (9–)12–16 mm. long, 7–10 mm. wide, cleft (5–)6–7 mm. into two equal obtuse to acutish segments, violet-blue to magenta, the tube a darker violet; corolla-tube 4–5 mm. wide (pressed), with druse-like stalked hairs of conical- to obtuse-tipped cells at the base of the palate. 4. *P. planifolia.*

c. Spur (3–)4–8 mm. long, cylindric, yellow; corolla-lobes obovate to orbicular, 8–15 mm. long, 7–16 mm. wide, usually broadly and shallowly notched 2–7 mm. into rounded segments (in No. 2 these segments sometimes more shallowly notched, in turn); cells of stalked hairs at base of palate with rounded tips.

d. Corolla chrome yellow, the tube 5–8(–10) mm. wide (pressed), the spur 5–9 mm. long; palate conical, the base with stalked hairs with enlarged tips of clustered, round-tipped cells. . . . . 2. *P. lutea.*

d. Corolla-limb violet blue (to almost white), with a white zone at the base, the tube (3–)4–5.5 mm. wide (pressed), lemon-yellow with brown veins, the spur yellow, 4–5 mm. long; palate conic-acicular, the base with short-stalked, smooth, flattened-pyriform to two-lobed (or mitten-shaped) hairs. . . . . 5. *P. primuliflora.*

1. **Pinguicula caerulea** Walt. Fl. Carol. 63. 1788.

P. elatior Michx. Fl. Bor.-Amer. **1:** 11. 1803.
Isoloba elatior (Michx.) Raf. Fl. Tellur. **4:** 59. 1838.

DISTRIBUTION: Open, wet, sandy and peaty soils in pinelands and savannas on the outer Coastal Plain, southeastern North Carolina to southern Florida (about the latitude of Lake Okeechobee) and westward to about the Apalachicola River, the distribution almost coinciding with that of *Tephrosia hispidula* (Michx.) Pers. Flowering late February–early May.

Pinguicula caerulea stands somewhat apart from the four other species of our area. The pale violet-blue, veiny corolla with its expanded tube and very pale hairy palate is unlike the other species in the Southeast. The enlarged multicellular hairs which characterize all of the latter are lacking and even the hairs on the palate are unlike those of the others.

Walter's name, taken up by Barnhart (1933) in place of the long-used *P. elatior* Michx. appears to be the correct one for this plant. The question of a type-specimen is not clear, however. Although *P. lutea* Walt. is represented in the Walter herbarium (page 83) by a specimen easily recognized from a photograph, from the published illustration it is not so apparent to us that specimen No. 487, on page 104, is "readily matched (as to profile) by . . . a representative sheet of *P. elatior* Michx. (1803) . . ." as suggested by Fernald and Schubert (1948, p. 224 & pl. 113). The corolla of this unmistakable *Pinguicula* is in such a position that only a partial profile, which lends itself as well to *P. lutea* as to *P. caerulea*, can be seen. It is probably either one or the other, but only a careful examination of the specimen itself can determine whether or not *P. caerulea* is actually represented in Walter's herbarium.

2. **Pinguicula lutea** Walt. Fl. Carol. 63. 1788.

P. campanulata Lam. Jour. Hist. Nat. Paris **1:** 334. 1792.
P. edentula Hook. Exot. Fl. **1:** *t. 16.* 1823.
Isoloba lutea (Walt.) Raf. Fl. Tellur. **4:** 59. 1838.
I. recurva Raf. Fl. Tellur. **4:** 59. 1838. (An illegitimate renaming of *P. edentula* Hook.)

DISTRIBUTION: Seasonally wet wire-grass and pine savannas of the Atlantic and Gulf Coastal Plains, from southeasternmost North Carolina to about the latitude of Lake Okeechobee, to southwestern Georgia, southern Alabama, southern Mississippi and eastern Louisiana. Flowering mid-February (in the south) to mid-May.

Plants from the Gulf Coast are often far larger, more vigorous and with correspondingly larger flowers than those of the Carolinas. The situation almost suggests that of *Drosera filiformis* and its more robust var. *Tracyi*, except that in this instance no differences other than size are evident nor is there a morphological break between specimens collected in the two areas. *Pinguicula lutea* is not easily cultivated, but the size-characteristics of Carolina and Mississippi plants are maintained at least through a second flowering season in cultivation.

Instead of being one-notched, the corolla-lobes of the species may be three-notched, a characteristic which occurs sporadically. The flower-color is constant and conspicuous, the only variation being in the presence or absence of brown venation in the corolla tube.

A characteristic worthwhile noting is that *Pinguicula lutea* frequently occupies somewhat drier habitats than the other species in our area. Blooming in spring, it may disappear during summer so that one suspects the existence of some method of aestivation (perhaps similar to the formation of winter buds in the boreal species), which permits the recurrence of growth in winter. Herbarium specimens give some indication of the production, under moist winter conditions, of leaves longer and more slender than those produced during the flowering period, thus suggesting somewhat the seasonally dimorphic leaves of some Mexican species of the genus.

3. **Pinguicula pumila** Michx. Fl. Bor.-Amer. **1:** 11. 1803.

P. australis Nutt. Jour. Acad. Nat. Sci. Philadelphia **7:** 103. 1834.
Isoloba pumila (Michx.) Raf. Fl. Tellur. **4:** 59. 1838.
P. floridensis Chapm. Fl. Southern U. S. ed. 1. 635. 1883.
P. pumila Michx. var. *Buswellii* Moldenke, Phytologia **1:** 98. 1934.

Distribution: Moist, sandy soil, generally in pinelands and savannas, from southeastern North Carolina, south to the Florida Keys and the Bahamas, and westward to central Louisiana and eastern Texas. Flowering November (tropical Fla.) to July (La.).

This diminutive species is by far the most variable of ours in respect to corolla color. Within a single colony may be found plants with either blue or white corolla lobes and with deeper blue or yellow tubes. (See *Godfrey 54483 & Kurz, Kral 4134 & Godfrey, Kral 4063* [FSU, GH].) Pink forms have been reported,

as well, while *Pinguicula pumila* var. *Buswellii*, from Collier County, Florida, is a form with entirely yellow flowers. Those individuals with blue corolla-lobes and yellow tube may be mistaken for small-flowered specimens of *P. primuliflora*. Under favorable conditions of moisture the rosettes of *P. pumila* may be more than twice the size of those usually collected. Plantlets, moreover, may proliferate from the leaves, a characteristic of frequent occurrence in both *P. primuliflora* and *P. planifolia* where likewise it is probably linked with abundant moisture.

4. **Pinguicula planifolia** Chapman, Fl. Southern U. S. ed. 3. 303. 1897.

DISTRIBUTION: Pond margins, ditches, etc., usually submerged, in the region of the Apalachicola River of western Florida (within the area bounded by Leon, Franklin, Gulf, and Walton Counties), westward to coastal Miss. (Jackson Co.: Ocean Springs, F. S. Earle, 8 Mar. 1888 [FLAS]; 8 mi. ne. of Ocean Springs, *R. L. Diener 825*, 30 Mar. 1953 [MISSA]). Flowering March to April.

Pinguicula planifolia is a most distinctive species with its relatively narrow and deeply cleft corolla-lobes, short tube and very short, almost sac-like spur. (See fig. 8, 9.) The stamen-filaments and stigma are violet. Its leaves are similar to those of *P. primuliflora*, but are more elliptic in shape and are usually suffused with reddish-purple color whereas those of *P. primuliflora* are always bright green. This latter characteristic reflects in part, at least, the more exposed habitat of *P. planifolia* for, plants of this species grown under more shaded conditions are green. However, *P. planifolia* becomes purple under light intensities which produce no change in *P. primuliflora*. The almost druse-like hairs at the base of the palate of *P. planifolia* are highly characteristic. It may be noted that, although the plant is described as nearly glabrous (Chapman, Small), it is, as in all of the other species, covered with glandular hairs.

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NOTES ON THE GRASS FLORA OF THE CHICAGO REGION

S. F. Glassman

The Chicago region as designated by Swink (1953) includes all or parts of four counties in Illinois (Lake, Cook, Du Page and Will) and parts of three counties in Indiana (Lake, Porter and La Porte). For the past three years I have been studying and collecting grasses with the intention of preparing a grass flora of this region. During this period, many new records were discovered and are reported here along with notes on these and other pertinent grasses.

Specimens cited were examined by me at the following herbaria: Chicago Natural History Museum (F), University of Illinois, Navy Pier (NP), University of Illinois, Urbana (ILL), University of Wisconsin (WIS), and University of Indiana (IND). I want to thank the curators of these herbaria for the privilege of studying their specimens.

Agropyron repens L. forma aristatum (Schum.) Holmb. was reported from Lake County, Indiana by Steyermark and Swink (1952). After examining a large number of specimens from the Chicago region, I have concluded that *Agropyron repens* is an exceedingly variable species with no clear cut varieties or forms. In some specimens the lemmas are either all awnless or all awned, whereas in other specimens the lemmas are acute, awn tipped, short awned or long awned on the same plant. Furthermore, it is difficult to follow Fernald's (1950) key to the varieties and forms, especially in the distinction between "glumes abruptly narrowed" versus "glumes gradually tapering from middle." Fassett (1951) states that it is not unusual to find two forms of this species in a single collection and any large patch is apt to contain several forms.

Agropyron smithii Rydb. cook: Palos Park, June 18, 1909, *Umbach*

3468 (WIS); West Englewood, June 20, 1918, *A. E. Johnson 3* (F). Previously reported from DuPage and Will Counties by Jones & Fuller (1955).

AGROSTIS PALUSTRIS Huds. COOK: Chicago, 92nd and Stony Island, August 10, 1956, *Glassman 3793* (NP); Oak Forest, July 3, 1914, *Hill 2/1914* (F). LAKE: Lake Villa, July 11, 1908, *Umbach 2290* (WIS). Previously reported from DuPage County by Jones & Fuller (1955). Fernald (1950) refers to this species as *Agrostis alba* var. *palustris* (Huds.) Pers. *A. palustris* has been frequently confused with *A. alba*, hence a key distinguishing the two follows:

Culms with leafy stolons and sometimes rhizomes in addition, densely matted; blades about 1–4 mm. wide, stiff; panicle branches closely appressed, closely contracted in fruit....*A. palustris.*
Culms with rhizomes, not matted; blades 3–10 mm. wide, lax; panicle open, partially contracted in fruit.....*A. alba.*

AGROSTIS PERENNANS var. AESTIVALIS Vasey. COOK: Riverside, Sept. 26, 1885, *Ohlendorf* (F). No previous records from the Chicago region. This variety is separated from the species by having smaller spikelets (1.5–1.8 mm. vs. 1.9–3.0 mm.) and by being smaller in size (less than 30 cm. vs. 30–100 cm.).

AGROSTIS SCABRA Willd. f. TUCKERMANI Fern. DU PAGE: Lisle, June 2, 1896, *Umbach 3300* (WIS). Not previously reported from the Chicago region. In this form the lemmas are dorsally awned.

ALOPECURUS PRATENSIS L. LAKE: Lake Forest, May, 1895, *M. L. Jensen 89* (F); COOK: Chicago, Graceland, June, 1905, *Gates 478* (F). Not previously reported for the Chicago region. This species differs from others in the region by the longer spikelets (3.5–5 mm. vs. 2–3 mm.) and longer anthers (2.5–3.0 mm. vs. 0.5 mm.).

ARISTIDA INTERMEDIA Scribn. & Ball. LAKE: Waukegan, June, and Sept. 4, 1909, *Gates 3260* and *Gates* (no number) (both ILL); PORTER: Beverly Shores, Aug. 28, and Sept. 5, 1956, *Glassman 3846* and *3899* (both NP). Not listed from Chicago region by Jones & Fuller (1955). Not listed by Deam (1940) for Porter County; however, cited by Pepoon (1927) for that county, but probably based on a misidentified specimen of *A. purpurascens* (see Fassett (1933)).

ARISTIDA LONGESPICA Poir. PORTER: Tremont, Oct. 9, 1955, *H. R. Bennett* (NP). First verifiable record for Porter County. Reported by Peattie (1930), but no specimens have been seen.

ARISTIDA PURPURASCENS Poir. DU PAGE: Wheaton, 1895, *Moffatt 3335* (WIS). Not previously reported from Du Page County.

BROMUS INERMIS Leyss. LAKE (Indiana): Hammond, June 24, 1933, *Deam 53918* (IND.). PORTER: Beverly Shores, Sept. 1, 1956, *Glassman 3888* (NP). Previous reports from the Indiana part of the Chicago region are by Peattie (1930), without a cited specimen, and by Deam et al. (1947) from La Porte County.

BROMUS JAPONICUS Thunb. PORTER: Beverly Shores, Sept. 1, 1956, *Glassman 3891* (NP). Also reported from La Porte County by Deam et al. (1947).

Bromus latiglumis (Shear) Hitchc. f. incanus (Shear) Fern. cook: Riverside, Aug. 14, 1884, *Ohlendorf* (f). Not previously reported from the Illinois part of the Chicago region. According to Wagnon (1950), the valid name for *B. latiglumis* (Shear) Hitch. is actually *Bromus purgans* L. Until I can personally look into the matter further, I prefer retaining the name *B. latiglumis*.

Bromus nottawayanus Fern. cook: Riverside, July 27, 1884, *Ohlendorf* (f). Wagnon (1952) lists this for the Sand Dune area of Indiana, but apparently, this is the first record for the Illinois portion of the Chicago region. This species is distinguished from *B. ciliatus*, *B. purgans*, and *B. latiglumis* by the distinctly five-nerved second glume. The status of this species is still doubtful since there are so few collections of it. Wagnon (1952) thinks that *B. nottowayanus* is probably a hybrid between *B. purgans* and *B. latiglumis*.

Bromus purgans L. du page: Warrenville, June 15, 1895, *Umbach 3355* (wis). First record for Du Page County. According to Wagnon (1950), the valid name for this species is *B. pubescens*, however, I am not using this designation until I investigate the matter further.

Bromus sterilis L. cook: Ravenswood, Chicago, June 12, 1905, *Gates 447* (f). First report for the Chicago region. Jones & Fuller (1955) listed a similar species, *B. rigidus* Roth, collected in Chicago by Gates in 1905. Mosher (1918) and Pepoon (1927) cited the same specimen under *B. villosus* Forsk. As I have not seen this specimen, I cannot be certain whether it is *B. rigidus* or *B. sterilis*. The two species are separated as follows:

Spikelets 2.5–3.0 cm.; first glume .8–1.0 cm., second glume 1.3–1.5 cm.; lemmas 1.5–2.0 cm., awns 2.0–3.0 cm. ..... *B. sterilis.*
Spikelets 3.0–4.0 cm.; first glume 1.5–2.0 cm., second glume 2.5–3.0 cm.; lemmas 2.5–3.0 cm., awns 3.5–5.0 cm. ..... *B. rigidus.*

Eleusine indica L. la porte: Michigan City, Aug. 27, 1956, *Glassman 3827* (np). First record for the Indiana part of the Chicago region.

Elymus villosus Muhl. f. arkansanus (Scribn. & Ball) Fern. du page: Downers Grove, *Umbach 11064*, July 14, 1900 (wis). Not previously reported from the Chicago region. The form differs from the species in having lemmas glabrate to puberulent on lower part of body and glabrate to short hispid on the upper part vs. lemmas glabrate to hispid on lower part and hispid to villous on upper part.

Eragrostis frankii C. A. Meyer. porter: Dunes State Park, Sept. 25, 1955, *H. R. Bennett* (np); Beverly Shores, Aug. 31, 1956, *Glassman 3886* (np). First record for Porter County. Deam (1929) states that Pepoon (1927) published a record of this species for Porter County, but he actually mentioned the plant for Cook County only.

Eragrostis poaeoides Beauv. porter: Beverly Shores, Aug. 28, 1956, *Glassman 3837* (np). First report for the Indiana part of the Chicago region. Since this species is frequently confused with *E. cilianensis* (All.) Link, a key separating the two is given below:

Mature spikelets 1–2 mm. wide, 5–9 mm. long; glands of lemmas and glumes mostly obscure ..... *E. poaeoides.*
Mature spikelets 2.5–3 mm. wide, 5–15 mm. long, glands of lemmas and glumes prominent ..... *E. cilianensis.*

FESTUCA ELATIOR L. PORTER: Porter, Aug. 16, 1920, *Peattie 214* (F). Not previously reported for Porter County.

FESTUCA OBTUSA Bieler. LAKE: Beach Station, July 3, 1909, *Umbach 3752* and *3753* (WIS). First record for Lake County.

HYSTRIX PATULA Moench. var. BIGELOVIANA (Fern.) Deam. LAKE (Illinois): Lake Forest, 1895, *M. L. Jensen 87* (F). COOK: Beverly Hills, June 22, 1902, *R. Bebb 902* (F). DU PAGE: Maple Grove Forest Preserve near Downers Grove, June 18, 1953, *Swink 2200* (F). Not previously reported from the Illinois part of the Chicago region.

LEPTOLOMA COGNATUM (Schultes) Chase. COOK: Chicago, near 49th and Lake Shore Drive, along Illinois Central RR., Aug. 11, 1956, *Glassman 3802* (NP); Chicago, between 14th and 31st Sts., Illinois Central RR. yards, Aug. 7, 1956, *Thieret 2184* (F). Not previously reported for the Illinois portion of the Chicago region.

MUHLENBERGIA FRONDOSA (Poir.) Fern. f. COMMUTATA (Scribn.) Fern. DU PAGE: Glen Ellyn, Sept. 2, 1917, *Benke 1967* (F); Wheaton, Sept. 8, 1892, *Moffatt 3459* (WIS). First report for the Chicago region of Illinois. Differs from the species in the awned lemmas.

MUHLENBERGIA GLOMERATA (Willd.) Trin. COOK: West side of Wolf Lake, Oct. 17, 1953, *H. R. Bennett* (F); Chicago Ridge, Aug. 12, 1951, *Swink 309* (F). First records for Cook County.

PANICUM MERIDIONALE Ashe. WILL: Two miles southeast of Custer Park, Aug. 24, 1947, *Steyermark 64862* (F). Not previously reported from Will County. This species has frequently been confused with *P. implicatum* Scribn. (sensu stricto), thus a key distinguishing the two follows:

Many of the culms and sheaths covered with a mixture of pilose and puberulent hairs; upper blade surfaces entirely covered with long pilose hairs ..... *P. meridionale.*
Culms and sheaths covered with either long pilose or short pilose hairs only; upper blade surfaces with long pilose hairs at base and margins, glabrous or medium to short pilose otherwise ..... *P. implicatum.*

PASPALUM CILIATIFOLIUM Michx. var. STRAMINEUM (Nash) Fernald. PORTER: Beverly Shores, Aug. 19, 1956, *Glassman 3803* (NP). Otherwise known from Miller and Liverpool (Lake County, Ind.) and Michigan City (La Porte County) in the Chicago region. Also called *P. stramineum* Nash by Deam (1940) and other authors.

POA TRIVIALIS L. LAKE (Indiana): Highland, Aug. 15, 1925, *Peattie 1999* (F). First verifiable record for the Indiana part of the Chicago region. Peattie (1932) listed it for Clarke, Lake County, but I have not seen this particular specimen. In the literature, e. g. Fernald (1950),

Chase (1951) and Pohl (1954), there seems to be some confusion and contradiction in distinguishing among *P. trivialis*, *P. palustris* L., *P. alsodes* Gray, and *P. languida* Hitchc. The following key attempts to separate these species:

Keel and marginal nerves of lemmas distinctly pubescent at least on lower half; panicle 10–30 cm. long ..... *P. palustris.*
Marginal nerves of lemmas glabrous or slightly pubescent on lower third; panicle 5–10 cm. long.
Lemmas very blunt, glabrous on keel; panicle branches in twos or threes ..... *P. languida.*
Lemmas acute at tip, pubescent on keel; panicle branches in fours or fives.
Spikelets 2.5–4.5 mm. long, crowded and subsessile or on short pedicels; second glume with prominent lateral nerves ..... *P. trivialis.*
Spikelets 4–6 mm. long, loosely arranged on the panicle; second glume with obscure lateral nerves ..... *P. alsodes.*

Setaria verticillata (L) Beauv. LAKE (Illinois): Waukegan, July 29, 1912, *Umbach 5849* (WIS). Not previously recorded from Lake County. Pepoon (1927) reported this species from Naperville, Du Page County, collected by Umbach, but the specimen cited is actually *S. lutescens* (Weigel) Hubb. (*S. glauca* (L.) Beauv.).

Setaria viridis × faberi ? COOK: Chicago, Chapell and 68th streets, Sept. 26, 1941, *Standley* (F); Chicago, 53rd and Lake Shore Dr., Aug. 20, 1956, *Glassman 3815* (NP). *S. viridis* (L.) Beauv. is separated from *S. faberi* Herrm. by having spikelets 1.8–2.5 mm. long and glabrous blades vs. spikelets 2.6–3.0 mm. long and softly pubescent to glabrescent blades. Both specimens cited above have glabrous blades, but the *Standley* specimen has spikelets 2.5–2.8 mm. long and *Glassman 3815* has spikelets 2.8–3.0 mm. long. It is therefore supposed that these plants may be hybrids between *S. viridis* and *S. faberi*.

Sorghum halepense (L.) Pers. COOK: Chicago, Brighton Park, Sept. 5, 1896, *Umbach 3539* (WIS). Another specimen listed for Cook County (East of Glencoe, June 22, 1907, *Gates 1686.1* (F)) by Pepoon (1927) is actually *Arrhenatherum elatius* (L.) Mert. & Koch f.; Mosher (1918) also cites the same specimen under *Holcus halepensis* L.

Sporobolus asper (Michx.) Kunth. LAKE (Indiana): Hobart, Sept. 19, 1936, *Benke 5797* (F). First verifiable record for the Chicago region of Indiana. Pepoon (1927) lists this species from Tremont, Porter County, but I have not seen a specimen from there.

Triodia flava (L.) Smyth f. cuprea (Jacq.) Fosberg. PORTER: Beverly Shores, Sept. 5, 1956, *Glassman 3902* (NP); east boundary of Dune State Park, N. side of Rt. 12, Sept. 3, 1955, *Thieret 1643* (NP). COOK: Chicago, University Ave. near 53rd St., vacant lot, Sept. 30, 1956, *Glassman 3933* (NP). First records for the Indiana part of Chicago region, and the second report for Cook County, the other being from Thornton by Steyermark and Swink (1955).

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A MODEST PLEA IN FAVOR OF DIVERS TAXONS.—Dr. Lam's coining of the term taxon is another demonstration that necessity is the mother of invention. The sudden popularity of the word, with an acquired double meaning, perhaps illustrates the equally true converse, that invention is the mother of necessity. Having acquired a felicitous term to use in one area, we suddenly discover how badly we needed just such a term in a closely parallel one. There is nothing wrong with using the same term in both. The English word "man" signifies something concrete and individual, something concrete but generalized, and, further, something abstract and generalized. No difficulty arises from all this. If we were to carry over the idea of strictly segregated terms, we should not be allowed to say "man is a warm-blooded

animal." We should have to say carefully, "mankind is a warm-blooded animal." Or perhaps we should have to coin a third intermediate term to make this statement, and reserve the existing compound one to use when speaking of the spirit or the progress of mankind. This would be quite needlessly pedantic. Actual usage is far more decisive than formal definitions. "Taxon" is here to stay for concrete as well as abstract uses, regardless of the narrow meaning originally intended, and both uses are legitimate. But Morton is justified in saying that the "unlimited extension of the meaning is not only ridiculous, it is worse, not precise" (Rhodora **59:** 43, 1957). Certainly if one is talking about species, one ought to say species, in preference to the indefinite term taxon. There are times, however, when the latter collective term is preferable. Surely it is better to shorten "species, varieties, and forms of *Panicum*, for example, to "taxa of (or within) *Panicum*." This involves literary taste and judgment, which cannot be subjected to precise rules. Scientists—especially in present-day America—are not notable for their talents in the way of literary expression, and unfortunately we shall have to endure another over-worked cliché, ranking with "the literature," "workers," and "the authors." If Morton's protest puts a stop to the excessive use of "taxon" on every possible occasion (and some impossible ones), without discernment or feeling for appropriateness and precision, he will have accomplished a miracle. But however scanty any optimism about the results, it is good to know that at least one American botanist has sufficient awareness and concern to express himself in print. "The literature" (grotesque phrase) grows constantly more stereotyped, more "acceptable," and more zombie-like.

The plural of taxon is another matter of literary taste. The officially prescribed plural, taxa, is of course correct for Latin or Greek. But in English, taxons is to me a more natural form. I prefer it, just as I prefer indexes to indices. Neither form is either more or less correct than the other. The word museum is so thoroughly naturalized that almost never does any plural except museums occur in common usage. Herbarium is a less well-established word, and rather inconsistently, the usual plural is herbaria. At times I prefer herbariums, but feel no need to be consistent about it. The excessive popu-

larity of "taxa" perhaps is symptomatic of two things: the appalling modern American eagerness to conform, and the chance to feel oneself a classical scholar of sorts without having to put forth any effort. Probably the most extreme example of an attempt to create the appearance of scholarship without any learning is the International Code of Zoological Nomenclature, the major portion of which now consists of "push-button" instructions (often contradictory, frequently incorrect, rarely indicative of literary taste or understanding) about Latin and Greek names, for those ignorant of classical languages and, one must assume, obstinate about not trying to learn. The practical unworkability of the multitude of instructions has long been painfully evident in zoological publications. It is obvious to anyone who tries to read through them, but apparently hardly anyone really does. It is a pity that botanists are not better acquainted with the Zoological Code; they would appreciate the great superiority of their own. Some of the worst features of the zoological one are persistently offered for incorporation in the botanical. Among these are proposals to lay down rigid regulations about the handling of Greek and Latin, of which the prescribed plural "taxa" is a minor example. It is neither necessary nor at all desirable to lay down a botanical (or zoological) law for all the minutiae. One cannot escape the fact that a certain amount of literary taste will always be involved. Experience has already shown the impossibility of strict regimentation.

So:—long live taxons, whatever the kind!—LLOYD H. SHINNERS, SOUTHERN METHODIST UNIVERSITY, DALLAS 5, TEXAS.

DRABA LANCEOLATA IN THE OTTAWA DISTRICT.[1] On May 23, 1947, three immature specimens of an unknown species of *Draba* were collected on the face of the Pre-Cambrian escarpment about ten miles northwest of the city of Ottawa. Up until this time only the easily recognized *Draba nemorosa* L. had been known in the vicinity of Ottawa. This, then, was a species new to the district, but final identification of the immature specimens was not possible.

It was not until July 6, 1956, that an opportunity arose to

[1] Contribution No. 1582 from the Botany and Plant Pathology Division, Science Service, Canada Department of Agriculture Ottawa, Ontario.

revisit the site. This time a sufficient number of mature plants to make several herbarium sheets were obtained. The densely stellate-pannose pubescence on the valves of the mature fruit served to help identify the species as *Draba lanceolata* Royle.

Data are as follows: QUEBEC, Gatineau County, Hull Township, conc. 8, lot 26, high on cliff face of south facing escarpment just west of King Mountain, *Dore, Cody & Breitung 47–35* (DAO); same locality, very rare in moist crevices and in dry moss patches on open faces of Pre-Cambrian rock, ca. 600 feet altitude, *Cody & van Rens 9379* (DAO). Duplicates of the latter collection will be sent to Montreal Botanic Garden, Gray Herbarium and Natural History Museum, Stockholm.

Fernald[2] gives the range of *D. lanceolata* as "Northern and alpine regions of Asia and North America; in America from eastern Quebec to Yukon, locally south to New Brunswick, northern New Hampshire, northern Vermont, Ontario, Michigan, Wisconsin, Colorado and Utah." The eastern American specimens seen by him are cited and a map showing their distribution is given. The southern Canadian localities given are Nashwaak in New Brunswick, Mt. St. Pierre, Bic and St. Fabien in the Gaspé area of Quebec, and Lion's Head and Dyer's Bay in Bruce Peninsula, Ontario.

Marie-Victorin[3] states that this plant is relict in his area (southern Quebec). It is certainly very rare in the Ottawa District since it has not been located elsewhere in the vicinity in over seventy-five years of botanical collecting, and its occurrence similarly appears to be relict. The site where it occurs is at an elevation of about 600 feet, some 400 feet above the plain the Ottawa River half a mile away. This is just below the presumed maximum level of the Champlain Sea in this area. It would thus appear that *D. lanceolata* reached the locality reported here via cliffs bordering the Champlain Sea. The retreat of that sea and the subsequent invasion of many more aggressive species has restricted *D. lanceolata*, which apparently cannot compete with them, to the open, almost inaccessible faces of the Pre-Cambrian escarpment. Similar habitats along this old shoreline might reveal other, as yet unrecorded, stations for this interesting plant which, in the southern part of its range, appears to be

[2] Fernald, M. L. Draba in temperate northeastern America. Rhodora 36: 358. 1934.

[3] Marie-Victorin, Frère, Flore Laurentienne. Imprimerie de la Salle, Montreal. 1935.

almost completely confined to cliffs and rocky faces which border present-day and ancient large bodies of water.

Draba lanceolata can now be added to the floras of the Ottawa District and of western Quebec.—W. J. Cody.

Alternanthera in Virginia.—*Alternanthera* (*Amaranthaceae*) is a tropical genus of more than 150 species. Two or three species occur in southeastern United States. One of these, *A. philoxeroides*, Griseb. (*Achyranthes p.*, (Mart.) Standley), is an aggressive weed in moist to wet soil and waterways along the Atlantic and Gulf coasts, especially in Louisiana and Mississippi. It has been introduced along some of the TVA Lakes in Tennessee. The genus is not listed in Gray's Manual, 8th Ed. It was first recorded in the manual range in southeastern Virginia in 1953 as a lawn pest in Hampton, Virginia. It has since been found in Princess Anne and Isle of Wight counties, Virginia. In Princess Anne County it is a pest in an asparagus field. It is believed to have been brought from eastern Carolina with asparagus plants. How or when it was introduced into Isle of Wight County and Hampton is not known. It is well established in both places, especially in southern Isle of Wight County where it has become distributed over a field of several acres. It is commonly known as alligator weed or by some people as alligator grass. It develops short jointed rhizomes very freely. When broken or cut into pieces each joint can develop a plant. Consequently it is difficult to eradicate. Weed killers have been used with varying success. Its control is discussed by Martin, A. C., in Improving Duck Marshes by Weed Control, Cir. 19, Fish and Wildlife Service, U. S. Dept. of Interior. Specimens have been placed in the Gray Herbarium—A. B. Massey, virginia polytechnic institute.

New Plant Station Records in Missouri.—During the past several years new locations have been noted for several species in Missouri. One species is apparently new to the State. The others, in locations to be described, hitherto have been overlooked or are currently expanding their range. The several species with collection data are as follows:

Pteridium aquilinum (L.) Kuhn var. latiusculum (Desv.) Underw. This fern, which occurs in the Ozarks, was previously unknown from Boone County in Central Missouri. Specimens were collected in open ground bordering steam, T50N, R13W, sect. 11, SW¼ in Boone County, July 20, 1955., (2455).

Phragmites communis Trin. var. Berlandieri (Fourn.) Fern. Spreading colonies were found on alluvial deposition bordering the Missouri River. This station, from which a collection was made, lies south and east of previously reported localities in the state, T47N, R14W, sect. 4, NW¼, Moniteau County, December 28, 1955., (2530).

Hexalectris spicata (Walt.) Barnh. Scattered plants were found in Boone County by Professor D. S. Van Fleet. Previously known in Missouri only from the Ozarks, this species is reported for the first time north of the Missouri River. Flowering specimens were growing in heavy woods on well-drained, loessial slopes, T48N, R14W, sect. 7, SW¼, August 11, 1955., (2471).

Medicago arabica (L.) Huds. Previously unreported for Missouri, this adventive was observed in open ground and roadways 1½ miles south of Sikeston, T25N, R14E, sect. 6, New Madrid Co. Locally abundant and apparently established, fruiting specimens of this species were collected by Dan Neely, May 10, 1955.

Helenium tenuifolium Nutt. This species, common to various parts of the Ozarks, was previously unknown from Boone County. It has been observed spreading to waste ground and roadsides. Specimens were collected from pasture, T49N, R13W, sect. 12, September 5, 1955., (2514).

Specimens have been prepared for deposit in the University of Missouri Herbarium.—C. L. Kucera, department of botany, university missouri, columbia.

CHROMOSOME NUMBERS IN THE HIGHER PLANTS.—A few months ago, while browsing through the book reviews in the last issue of the "Quarterly Review of Biology," my eye was caught by the statement that ". . . one half of all the ferns and flowering plants are of polyploid origin. . . ." [1] That statement seemed to me to be unscientific; unscientific, because I did not believe that available data would substantiate the quantitative part of the assertion; unscientific, because we do not have the historical knowledge of plant genera and species which the word "origin" implies.

This statement did prompt me to turn my attention to the "Chromosome Atlas of Flowering Plants" [2] by Darlington and Wylie, which purports to (and probably does) summarize our knowledge of chromosome number in the gymnosperms and angiosperms. This book supplies the raw data on which statements about relative abundance of chromosome numbers in these two groups may be based. Though it is only a compilation—and subject to all the faults that pertain thereto—it fills a definite need. It deserves the attention of systematists, taxonomists—and geneticists. In order to see what the facts bearing on the preliminary statement might be, I sat down with the "Atlas . . . ," an adding machine, and a few books of reference. The following figures were the result.

According to the best estimate available,[3] there are, in the world today, about 250,700 species of angiosperms and gymnosperms. Of these, about 720 are gymnosperms, 200,000 are dicotyledons, and 50,000 are monocotyledons. Darlington and Wylie record that in these three groups representatives of some 15,000 species have been analyzed. This constitutes about 6% of the total number of species known. A count of the data given shows that about 5,000 species, or ⅓ of the total number analyzed, give evidence of a polyploid chromosome number. Thus, to date, about 2% of the total number of species of higher plants have been proved to have polyploid representatives. This can hardly be construed as ". . . one half. . . ."

On using the "Chromosome Atlas of Flowering Plants," one is impressed by a number of rather significant tendencies. Perhaps the most striking is the large number of chromosome counts which appear to be based on but a single report—or, alternatively, the number of species with a stable chromosome number. By my count, only about 1,700 taxa, or 11% of the number analyzed, are recorded with two or more different chromosome numbers. A second bias is the geographical limitation of origin of these reports, the vast majority from western Europe, temperate North America, India and Japan.

One is impressed, also, by the large number of species of economic importance which have been reported on. The taxonomist will remember

[1] Quart. Rev. Biol. 31 (2): 133, June, 1956.

[2] Darlington, C. D. and Wylie, A. P.—Chromosome Atlas of Flowering Plants—London, Allen and Unwin, Ltd. 1955. pp. 519.

[3] Jones, G. N. on the number of Species of Plants. Scientific Monthly, 72 (5): 289–295. May, 1951.

that plants in cultivation are not necessarily characteristic of the wild populations, morphologically or cytologically, and that identifications of cultivated material—including plants in botanic gardens—are not infrequently of dubious validity. Likewise, a significant proportion of the species appears to be native in temperate regions. It will be remembered that such plants are, at least occasionally, exposed to conditions of, for them, extreme cold. It will be remembered that this is one of the conditions which have been known to induce cytological abnormalities.

One is impressed by the paucity of reports on tropical plants. This, despite the fact that speciation is probably more fully developed in the tropical rainforest than in the temperate zone. For instance, the *Orchidaceae*, a predominantly tropical family, is well known for extreme variation of floral morphology. It is a family estimated to contain more than 15,000 species—more than the number of species that is recorded in the "Atlas" for all of the higher plants. However, apparently only about 195 species (or 1.3%) of the orchids have been studied cytologically. Of three orchidaceous genera, any one of which contains more than one thousand species, counts are recorded for only eight species of *Dendrobium*. Six species of *Epidendrum*, and no species of *Bulbophyllym*.

The orchids are not alone in not having been studied. The *Convolvulaceae*, with an estimated 1,650 species in 55 genera,[4] are represented in the "Atlas" by 51 species (3%), in 14 genera of which about 16 appear to be polyploids. The genus *Ipomoea*, estimated to contain about 500 species,[4] is represented by only 11 species (2%), of which possibly four species are polyploids. The *Palmae*, with a world census of about 1500 species in 200 genera,[5] is represented in the "Atlas" by about 78 species (5%) in 50 genera. No polyploids seem to have been recorded. The *Proteaceae*, with about 1300 species in 60 genera,[4] are represented by 36 (3%) species in 24 genera. There appear to be about 11 polyploids recorded. The *Flacourtiaceae*, likewise with about 1300 species in 84 genera,[4] are adumbrated to the extent of 6 species (.5%) two of which are polyploids in three genera. The *Dioscoreaceae*, with 600 species in 9 genera, are represented by some 20 species (3%) with 14 polyploids in 3 genera.

This is not to imply, however, that plants of the temperate zones have been exhaustively studied. The *Compositae*, for instance, which include some 13,000 species in 900 genera,[5] have been studied to date to the extent of 852 species (7%) in 199 genera. There appear to be some 300 polyploids. The genus *Senecio*, with an estimated 2,000 species,[5] is represented by counts of 38 species, (2%) 36 of which seem to be polyploids. It would seem incautious, however, to assume that 94% of the genus is polyploid on the basis of such a scanty sample. The *Umbelliferae*, an admittedly intricate family taxonomically, are reputed to include about 2,700 species in 200 genera.[5] To date we have counts for 187 (7%) species in 79 genera. Twenty-four polyploids have been reported.

[4] Flora Malesiana, Series I, vols. 4 and 5.

[5] Willis, J. C. Dictionary of the Flowering Plants and Ferns, Ed. 6. Cambridge (repr. 1948).

The *Gramineae* is said to include about 4500 species in 450 genera. Of this number, some 1350 species (30%) in 255 genera have been analyzed. Somewhat over 900 of the species seem to be polyploids. This is a proportion significantly higher than the average for the rest of the higher plants. Indeed, comparisons may be made only with genera such as *Sedum* or *Salix*. It would seem that conclusions based on this apparent divergence from the normal should await the accumulation of considerably more data than are available at present.

The *Leguminosae* is a particularly instructive family from the viewpoint of chromosome numbers. In the sixth edition of Willis's "Dictionary of the Flowering Plants and Ferns" the family was credited with about 600 genera. Recent estimates of the number of genera, published in the "Flore du Congo-belge" approximate the figures given by Willis.

The legumes are customarily divided into three sub-families or families. Two of the groups (*Mimosoideae* and *Caesalpinioideae*) which account for about 200 genera and 2500 species are predominantly tropical. The third group (*Papilionatae*) accounts for the balance—some 400–425 genera and about 10,000 species. It is predominantly temperate or warm-temperate in distribution.

Taking the *Mimosoideae* and *Caesalpinioideae* together, the "Atlas" accounts for 47 genera (about 23%) and 204 species (about 13%). My count gives 52 polyploids, or about 25% of the species analyzed. This would seem a far cry from the alleged one half.

We turn now to the sub-family *Papilionatae*, which comprises an estimated 400 genera and 10,000 species. It is predominantly temperate and warm-temperate in distribution. It includes at least 15 genera with more than 100 species. The largest genus, *Astragalus*, has about 1600 species. Many of the species of the sub-family have an economic importance. If cytological analysis had progressed to any great length, one would be inclined to think that this sub-family should give an excellent test of the correlation of polyploidy with speciation. Study of the "Atlas" reveals the following:

TRIFOLIUM is a genus of about 290 species. The "Atlas" records counts for about 40 species, with 8 polyploids. With two exceptions, all of the species are reputed to be used for forage. 28 of the species are listed as European in distribution. In the area covered by Hegi, about 200 species are recorded. 6 of the reported species are reputed to be native in western North America. Abrams accounts for 54 species in part of the same area.

LUPINUS is a genus of about 150 species. The "Atlas" records counts for 22 species, of which nearly all are polyploids. Five species are attributed to Europe. Hegi lists 28. Nine are referred to the west coast of this country. Abrams records 84. One might note in passing that the common *Lupinus perennis*, widespread in the eastern United States is not recorded.

DESMODIUM is a genus of about 170 species, strongly developed in the tropics and sub-tropics. Counts for 11 species are recorded in the "Atlas." Five of the species fall within the "Grays Manual" range. Schubert, in Fernald, accounts for 24 species. No polyploids have been recorded.

ASTRAGALUS, as noted above, is a genus of about 1600 species. The "Atlas" records 5 species, one of them a polyploid, from western North America.

Abrams records 140 species. Five species in the "Atlas" are attributed to the "Grays Manual" range. Fernald records 25 from the same area. Nine or ten species are referred to Europe. Hegi records about 100 species. Fourteen species are supposed to be Asiatic. The Flora URSS records 849. "The Flora of British India" records 70 species. Altogether the "Atlas" records 35 species.

We must thank Drs. Darlington and Wylie for this compilation, for it shows us very clearly how little we know about chromosome numbers in plants. The "Chromosome Atlas of Flowering Plants" is a valuable statement of progress—but we must not misconstrue it as a final report. I fear that the vast majority of the figures reported here are based upon samples that are statistically meaningless. They can, indeed, be taken only as a very general indication of what we might expect to find should we chose to investigate more fully. In no sense may these reports be treated as though they were axioms of Euclidian geometry. We need to know a great deal more about populations, and about species, and about genera before we use these facts, or any related facts, in any large scheme of speculation. We can neither affirm nor deny that . . . "half of all the ferns and flowering plants are of polyploid origin." We can only say that present evidence does not lend much credence to this assertion.—Gordon P. DeWolf, Jr.

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